This key should allow you to understand why you choose the option you did (beyond just getting a question right or wrong). More instructions on how to use this key can be found here.

If you have a suggestion to make the keys better, please fill out the short survey here.

Note: This key is auto-generated and may contain issues and/or errors. The keys are reviewed after each exam to ensure grading is done accurately. If there are issues (like duplicate options), they are noted in the offline gradebook. The keys are a work-in-progress to give students as many resources to improve as possible.

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1. A town has an initial population of 90000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	89960	89920	89880	89840	89800	89760	89720	89680	89640

The solution is Linear, which is option C.

A. Exponential

This suggests the fastest of growths that we know.

B. Non-Linear Power

This suggests a growth faster than constant but slower than exponential.

C. Linear

This suggests a constant growth. You would be able to add or subtract the same amount year-to-year if this is the correct answer.

D. Logarithmic

This suggests the slowest of growths that we know.

E. None of the above

Please contact the coordinator to discuss why you believe none of the options model the population.

General Comment: We are trying to compare the growth rate of the population. Growth rates can be characterized from slowest to fastest as: logarithmic, indirect, linear, direct, exponential. The best way to approach this is to first compare it to linear (is it linear, faster than linear, or slower than linear)? If faster, is it as fast as exponential? If slower, is it as slow as logarithmic?

---

2. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 506 grams of element X and after 4 years there is 72 grams remaining.

The solution is About 365 days, which is option D.

A. About 1 day

This models half-life as a linear function.

B. About 730 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

C. About 1825 days

This uses the correct model but solves for the exponential constant incorrectly.

D. About 365 days

* This is the correct option.

E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0(\frac{1}{2})^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \frac{A_0}{2}$. Your answer would be in years, so convert to days.

---

3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $130°$ *C and is placed into a* $11°$ *C bath to cool. After 19 minutes, the uranium has cooled to* $77°$ *C.*

The solution is $k = -0.03102$, which is option B.

A. $k = -0.03568$

This uses A as the initial temperature and solves for k correctly.

B. $k = -0.03102$

* This is the correct option.

C. $k = -0.03816$

This uses A correctly but solves for k incorrectly.

D. $k = -0.03758$

This uses A as the initial temperature and solves for k incorrectly.

E. None of the above

If you chose this, please contact the coordinator to discuss why you believe none of the other answers are correct.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

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4. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $160°$ *C and is placed into a* $17°$ *C bath to cool. After 16 minutes, the uranium has cooled to* $113°$ *C.*

The solution is $k = -0.02491$, which is option D.

A. $k = -0.04784$

This uses A correctly but solves for k incorrectly.

B. $k = -0.03193$

This uses A as the initial temperature and solves for k correctly.

C. $k = -0.04696$

This uses A as the initial temperature and solves for k incorrectly.

D. $k = -0.02491$

* This is the correct option.

E. None of the above

If you chose this, please contact the coordinator to discuss why you believe none of the other answers are correct.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

---

5. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 508 grams of element X and after 4 years there is 50 grams remaining.

The solution is About 365 days, which is option A.

A. About 365 days

* This is the correct option.

B. About 365 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

C. About 1 day

This models half-life as a linear function.

D. About 1825 days

This uses the correct model but solves for the exponential constant incorrectly.

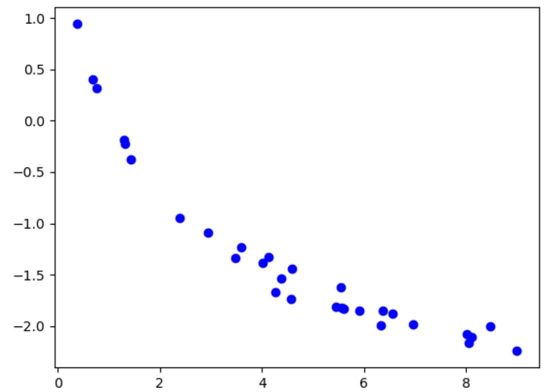
E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0(\frac{1}{2})^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \frac{A_0}{2}$. Your answer would be in years, so convert to days.

---

6. Determine the appropriate model for the graph of points below.



The solution is Logarithmic model, which is option A.

A. Logarithmic model

 For this to be the correct option, we want a rapid change early, then an extremely slow change later.

B. Non-linear Power model

 For this to be the correct option, we need to see a polynomial or rational shape.

C. Exponential model

 For this to be the correct option, we want an extremely slow change early, then a rapid change later.

D. Linear model

 For this to be the correct option, we need to see a mostly straight line of points.

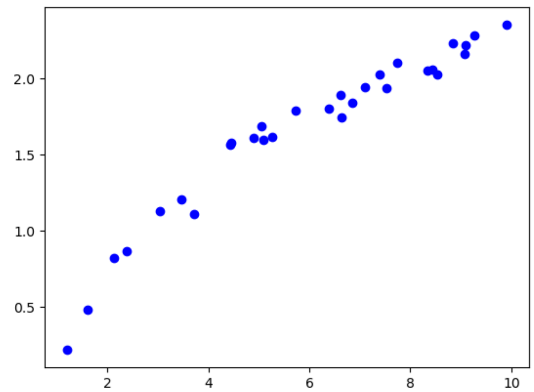
E. None of the above

 For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

---

7. Determine the appropriate model for the graph of points below.



The solution is Logarithmic model, which is option D.

A. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

B. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

C. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

D. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

---

8. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 1 hours, the petri dish has 37 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

The solution is About 29 minutes, which is option B.

A. About 246 minutes

This does not solve for the constant correctly AND converted incorrectly.

B. About 29 minutes

* This is the correct option.

C. About 176 minutes

This solves for the constant correctly but converted incorrectly.

D. About 41 minutes

This does not solve for the constant correctly.

E. None of the above

Please contact the coordinator to discuss why you believe none of the answers above are correct.

General Comment: Your model should be $P(t) = P_0(b)^{kt}$, where $P(t)$ is the population at some time t, P_0 is the initial population, and k is the replication rate. Be sure you convert the hours into minutes!

---

9. A town has an initial population of 50000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	50040	50080	50120	50160	50200	50240	50280	50320	50360

The solution is Linear, which is option B.

A. Non-Linear Power

This suggests a growth faster than constant but slower than exponential.

B. Linear

This suggests a constant growth. You would be able to add or subtract the same amount year-to-year if this is the correct answer.

C. Logarithmic

This suggests the slowest of growths that we know.

D. Exponential

This suggests the fastest of growths that we know.

E. None of the above

Please contact the coordinator to discuss why you believe none of the options model the population.

General Comment: We are trying to compare the growth rate of the population. Growth rates can be characterized from slowest to fastest as: logarithmic, indirect, linear, direct, exponential. The best way to approach this is to first compare it to linear (is it linear, faster than linear, or slower than linear)? If faster, is it as fast as exponential? If slower, is it as slow as logarithmic?

---

10. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 3 hours, the petri dish has 9022 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

The solution is None of the above, which is option E.

A. About 15 minutes

This uses the wrong base.

B. About 35 minutes

This uses the wrong base and does not solve for the constant correctly.

C. About 93 minutes

This uses the wrong base and solves for the constant correctly but converted incorrectly.

D. About 212 minutes

This uses the wrong base, does not solve for the constant correctly, AND converted incorrectly.

E. None of the above

* This is the correct option as all other options used the wrong base in their model.

General Comment: Your model should be $P(t) = P_0(b)^{kt}$, where $P(t)$ is the population at some time t, P_0 is the initial population, and k is the replication rate. Be sure you convert the hours into minutes!

---

11. A town has an initial population of 100000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	100000	99979	99967	99958	99951	99946	99941	99937	99934

The solution is Logarithmic, which is option C.

A. Non-Linear Power

This suggests a growth faster than constant but slower than exponential.

B. Exponential

This suggests the fastest of growths that we know.

C. Logarithmic

This suggests the slowest of growths that we know.

D. Linear

This suggests a constant growth. You would be able to add or subtract the same amount year-to-year if this is the correct answer.

E. None of the above

Please contact the coordinator to discuss why you believe none of the options model the population.

General Comment: We are trying to compare the growth rate of the population. Growth rates can be characterized from slowest to fastest as: logarithmic, indirect, linear, direct, exponential. The best way to approach this is to first compare it to linear (is it linear, faster than linear, or slower than linear)? If faster, is it as fast as exponential? If slower, is it as slow as logarithmic?

---

12. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 808 grams of element X and after 6 years there is 115 grams remaining.

The solution is About 730 days, which is option C.

A. About 1 day

This models half-life as a linear function.

B. About 2555 days

This uses the correct model but solves for the exponential constant incorrectly.

C. About 730 days

* This is the correct option.

D. About 1095 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0(\frac{1}{2})^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \frac{A_0}{2}$. Your answer would be in years, so convert to days.

---

13. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $150°$ *C and is placed into a* $15°$ *C bath to cool. After 16 minutes, the uranium has cooled to* $84°$ *C.*

The solution is $k = -0.04195$, which is option A.

A. $k = -0.04195$

* This is the correct option.

B. $k = -0.04481$

This uses A correctly but solves for k incorrectly.

C. $k = -0.04403$

This uses A as the initial temperature and solves for k incorrectly.

D. $k = -0.04853$

This uses A as the initial temperature and solves for k correctly.

E. None of the above

If you chose this, please contact the coordinator to discuss why you believe none of the other answers are correct.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

---

14. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 190° C and is placed into a 12° C bath to cool. After 20 minutes, the uranium has cooled to 131° C.

The solution is None of the above, which is option E.

A. $k = -0.03825$

This uses A as the initial temperature and solves for k incorrectly.

B. $k = -0.06857$

This uses A as the bath temperature and solves for k incorrectly.

C. $k = -0.03865$

This uses A correctly and solves for k incorrectly.

D. $k = -0.02340$

This uses A as the initial temperature and solves for k correctly.

E. None of the above

* This is the correct answer as $k = -0.02013$.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

---

15. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 690 grams of element X and after 6 years there is 69 grams remaining.

The solution is About 365 days, which is option A.

A. About 365 days

* This is the correct option.

B. About 730 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

C. About 1 day

This models half-life as a linear function.

D. About 2920 days

This uses the correct model but solves for the exponential constant incorrectly.

E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0(\frac{1}{2})^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \dfrac{A_0}{2}$. Your answer would be in years, so convert to days.

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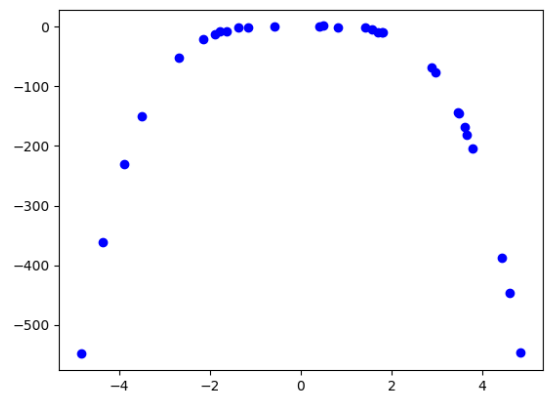
16. Determine the appropriate model for the graph of points below.



The solution is Non-linear Power model, which is option C.

A. Logarithmic model

For this to be the correct option, we want a rapid change early, then an extremely slow change later.

B. Linear model

For this to be the correct option, we need to see a mostly straight line of points.

C. Non-linear Power model

For this to be the correct option, we need to see a polynomial or rational shape.

D. Exponential model

For this to be the correct option, we want an extremely slow change early, then a rapid change later.

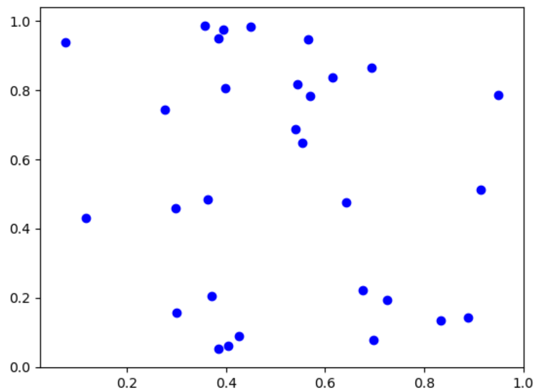
E. None of the above

For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

---

17. Determine the appropriate model for the graph of points below.



The solution is None of the above, which is option E.

A. Non-linear Power model

   For this to be the correct option, we need to see a polynomial or rational shape.

B. Exponential model

   For this to be the correct option, we want an extremely slow change early, then a rapid change later.

C. Linear model

   For this to be the correct option, we need to see a mostly straight line of points.

D. Logarithmic model

   For this to be the correct option, we want a rapid change early, then an extremely slow change later.

E. None of the above

   For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

---

18. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 4 bacteria-α. After 2 hours, the petri dish has 159 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

The solution is About 35 minutes, which is option B.

A. About 214 minutes

   This solves for the constant correctly but converted incorrectly.

B. About 35 minutes

   * This is the correct option.

C. About 352 minutes

This does not solve for the constant correctly AND converted incorrectly.

D. About 58 minutes

This does not solve for the constant correctly.

E. None of the above

Please contact the coordinator to discuss why you believe none of the answers above are correct.

General Comment: Your model should be $P(t) = P_0(b)^{kt}$, where $P(t)$ is the population at some time t, P_0 is the initial population, and k is the replication rate. Be sure you convert the hours into minutes!

---

19. A town has an initial population of 60000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	59950	59900	59850	59800	59750	59700	59650	59600	59550

The solution is Linear, which is option B.

A. Logarithmic

This suggests the slowest of growths that we know.

B. Linear

This suggests a constant growth. You would be able to add or subtract the same amount year-to-year if this is the correct answer.

C. Exponential

This suggests the fastest of growths that we know.

D. Non-Linear Power

This suggests a growth faster than constant but slower than exponential.

E. None of the above

Please contact the coordinator to discuss why you believe none of the options model the population.

General Comment: We are trying to compare the growth rate of the population. Growth rates can be characterized from slowest to fastest as: logarithmic, indirect, linear, direct, exponential. The best way to approach this is to first compare it to linear (is it linear, faster than linear, or slower than linear)? If faster, is it as fast as exponential? If slower, is it as slow as logarithmic?

---

20. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 2 hours, the petri dish has 1657 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

The solution is None of the above, which is option E.

A. About 79 minutes

This uses the wrong base and solves for the constant correctly but converted incorrectly.

B. About 29 minutes

This uses the wrong base and does not solve for the constant correctly.

C. About 174 minutes

This uses the wrong base, does not solve for the constant correctly, AND converted incorrectly.

D. About 13 minutes

This uses the wrong base.

E. None of the above

* This is the correct option as all other options used the wrong base in their model.

General Comment: Your model should be $P(t) = P_0(b)^{kt}$, where $P(t)$ is the population at some time t, P_0 is the initial population, and k is the replication rate. Be sure you convert the hours into minutes!

---

21. A town has an initial population of 70000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	70020	70040	70060	70080	70100	70120	70140	70160	70180

The solution is Linear, which is option D.

A. Non-Linear Power

This suggests a growth faster than constant but slower than exponential.

B. Logarithmic

This suggests the slowest of growths that we know.

C. Exponential

This suggests the fastest of growths that we know.

D. Linear

This suggests a constant growth. You would be able to add or subtract the same amount year-to-year if this is the correct answer.

E. None of the above

Please contact the coordinator to discuss why you believe none of the options model the population.

General Comment: We are trying to compare the growth rate of the population. Growth rates can be characterized from slowest to fastest as: logarithmic, indirect, linear, direct, exponential. The best way to approach this is to first compare it to linear (is it linear, faster than linear, or slower than linear)? If faster, is it as fast as exponential? If slower, is it as slow as logarithmic?

---

22. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 771 grams of element X and after 5 years there is 77 grams remaining.

The solution is About 365 days, which is option B.

A. About 730 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

B. About 365 days

* This is the correct option.

C. About 1 day

This models half-life as a linear function.

D. About 2190 days

This uses the correct model but solves for the exponential constant incorrectly.

E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0(\frac{1}{2})^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \frac{A_0}{2}$. Your answer would be in years, so convert to days.

---

23. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $200°$ *C and is placed into a* $18°$ *C bath to cool. After 25 minutes, the uranium has cooled to* $150°$ *C.*

The solution is $k = -0.01285$, which is option C.

A. $k = -0.03101$

This uses A as the initial temperature and solves for k incorrectly.

B. $k = -0.03148$

This uses A correctly but solves for k incorrectly.

C. $k = -0.01285$

* This is the correct option.

D. $k = -0.01662$

This uses A as the initial temperature and solves for k correctly.

E. None of the above

If you chose this, please contact the coordinator to discuss why you believe none of the other answers are correct.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

---

24. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of $200°$ *C and is placed into a* $17°$ *C bath to cool. After 13 minutes, the uranium has cooled to* $156°$ *C.*

The solution is None of the above, which is option E.

A. $k = -0.06027$

This uses A as the initial temperature and solves for k incorrectly.

B. $k = -0.06113$

This uses A correctly and solves for k incorrectly.

C. $k = -0.02799$

This uses A as the initial temperature and solves for k correctly.

D. $k = -0.09902$

This uses A as the bath temperature and solves for k incorrectly.

E. None of the above

* This is the correct answer as $k = -0.02115$.

General Comment: The initial temperature is when $t = 0$. Unlike power models, that means A is not the initial temperature!

---

25. Using the scenario below, model the situation using an exponential function and a base of $\frac{1}{2}$. Then, solve for the half-life of the element, rounding to the nearest day.

The half-life of an element is the amount of time it takes for the element to decay to half of its initial starting amount. There is initially 741 grams of element X and after 7 years there is 82 grams remaining.

The solution is About 730 days, which is option C.

A. About 1095 days

This uses the correct model but a base of e rather than $\frac{1}{2}$.

B. About 3285 days

This uses the correct model but solves for the exponential constant incorrectly.

C. About 730 days

* This is the correct option.

D. About 1 day

This models half-life as a linear function.

E. None of the above

Please contact the coordinator if you believe all the options above are incorrect.

General Comment: The model should be $A(t) = A_0(\frac{1}{2})^{kt}$, where $A(t)$ is the amount after t years, A_0 is the initial amount, and k is decay constant. To find the half-life, you need to solve for k by using the amount after x years, then solve for the time t when $A = \frac{A_0}{2}$. Your answer would be in years, so convert to days.

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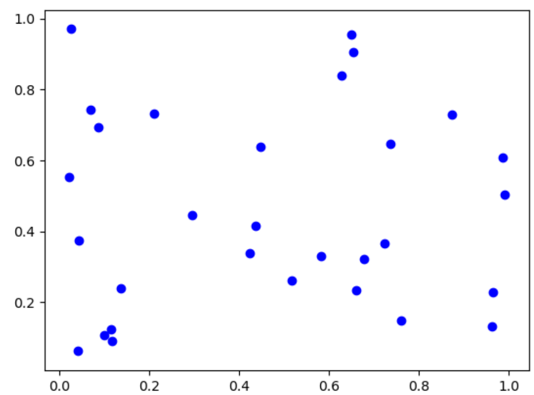
26. Determine the appropriate model for the graph of points below.



The solution is None of the above, which is option E.

A. Linear model

   For this to be the correct option, we need to see a mostly straight line of points.

B. Non-linear Power model

   For this to be the correct option, we need to see a polynomial or rational shape.

C. Exponential model

   For this to be the correct option, we want an extremely slow change early, then a rapid change later.

D. Logarithmic model

   For this to be the correct option, we want a rapid change early, then an extremely slow change later.

E. None of the above

   For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

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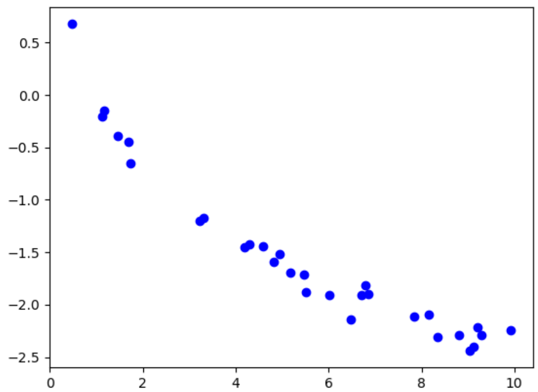
27. Determine the appropriate model for the graph of points below.



The solution is Logarithmic model, which is option C.

A. Linear model

   For this to be the correct option, we need to see a mostly straight line of points.

B. Exponential model

   For this to be the correct option, we want an extremely slow change early, then a rapid change later.

C. Logarithmic model

   For this to be the correct option, we want a rapid change early, then an extremely slow change later.

D. Non-linear Power model

   For this to be the correct option, we need to see a polynomial or rational shape.

E. None of the above

   For this to be the correct option, we want to see no pattern in the points.

General Comment: This question is testing if you can associate the models with their graphical representation. If you are having trouble, go back to the corresponding Core module to learn about the specific function you are having trouble recognizing.

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28. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 19 bacteria-α. Based on similar bacteria, the lab believes bacteria-α triples after some undetermined number of minutes.

The solution is About 34 minutes, which is option D.

A. About 264 minutes

   This does not solve for the constant correctly AND converted incorrectly.

B. About 209 minutes

   This solves for the constant correctly but converted incorrectly.

C. About 44 minutes

This does not solve for the constant correctly.

D. About 34 minutes

* This is the correct option.

E. None of the above

Please contact the coordinator to discuss why you believe none of the answers above are correct.

General Comment: Your model should be $P(t) = P_0(b)^{kt}$, where $P(t)$ is the population at some time t, P_0 is the initial population, and k is the replication rate. Be sure you convert the hours into minutes!

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29. A town has an initial population of 70000. The town's population for the next 10 years is provided below. Which type of function would be most appropriate to model the town's population?

Year	1	2	3	4	5	6	7	8	9
Pop	69950	69900	69850	69800	69750	69700	69650	69600	69550

The solution is Linear, which is option B.

A. Exponential

This suggests the fastest of growths that we know.

B. Linear

This suggests a constant growth. You would be able to add or subtract the same amount year-to-year if this is the correct answer.

C. Non-Linear Power

This suggests a growth faster than constant but slower than exponential.

D. Logarithmic

This suggests the slowest of growths that we know.

E. None of the above

Please contact the coordinator to discuss why you believe none of the options model the population.

General Comment: We are trying to compare the growth rate of the population. Growth rates can be characterized from slowest to fastest as: logarithmic, indirect, linear, direct, exponential. The best way to approach this is to first compare it to linear (is it linear, faster than linear, or slower than linear)? If faster, is it as fast as exponential? If slower, is it as slow as logarithmic?

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30. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab started with a petri dish of 2 bacteria-α. After 3 hours, the petri dish has 64 bacteria-α. Based on similar bacteria, the lab believes bacteria-α doubles after some undetermined number of minutes.

The solution is None of the above, which is option E.

A. About 57 minutes

This uses the wrong base.

B. About 77 minutes

   This uses the wrong base and does not solve for the constant correctly.

C. About 342 minutes

   This uses the wrong base and solves for the constant correctly but converted incorrectly.

D. About 465 minutes

   This uses the wrong base, does not solve for the constant correctly, AND converted incorrectly.

E. None of the above

   * This is the correct option as all other options used the wrong base in their model.

General Comment: Your model should be $P(t) = P_0(b)^{kt}$, where $P(t)$ is the population at some time t, P_0 is the initial population, and k is the replication rate. Be sure you convert the hours into minutes!